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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re application of
Shuuji YANO, et al.

Docket No: Q66287

Appln. No.: 09/955,928

Group Art Unit: 1772

Confirmation No.: 9968

Examiner: Sow Fun HON

Filed: September 20, 2001

For: OPTICAL SHEET, POLARIZER AND LIQUID-CRYSTAL DISPLAY DEVICE

REQUEST FOR RECONSIDERATION UNDER 37 C.F.R. § 1.111

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated July 2, 2003, reconsideration and allowance of the subject application are respectfully requested. Upon entry of this Request, claims 1-8 are pending in the application. Applicant respectfully submits the pending claims define patentable subject matter.

I. Preliminary Matters

Claims 1-8 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite because the Examiner contends that "it is unclear what the symbol \approx denotes." However, Applicant respectfully states that the § 112, second paragraph, rejection is improper since the symbol \approx is a well defined mathematical operator which represents the relationship of "approximately

equal to". Accordingly, the Examiner is requested to remove the § 112, second paragraph, rejection.

II. The Present Invention

The present invention is directed to an optical sheet by which light between polarizers disposed in the form of crossed-Nicol can be cut off at wide-ranging azimuth angles so that a good-display-quality vertically oriented liquid-crystal display device which is excellent in viewing angle and contrast can be formed.

As shown in Figure 1 illustrating a liquid-crystal display device which is constituted by a pair of optical sheets 1, the optical sheet 1 comprises a retardation film 11 (13), and a transparent layer 12 (14). The liquid-crystal display device further includes a pair of polarizing films 2 each including a transparent protective layer 21, and a vertically oriented liquid-crystal cell 3.

The retardation film 11 (13) exhibits $N_z = (n_x - n_z)/(n_x - n_y)$ in a range of from 0.6 to 0.9, preferably in a range of from 0.7 to 0.8, and a retardation $(n_x - n_y)d$ in a range of from 200 to 350 nm, preferably in a range of from 230 to 300 nm, more preferably in a range of from 250 to 280 nm in which d is the thickness of the retardation film, n_z is the refractive index in a direction of a Z axis expressing a direction of the thickness d of the retardation film, n_x is the refractive index in a direction of an X axis expressing a direction of the retardation film in a plane perpendicular to the Z axis while the X axis also expresses a direction of the highest in-plane refractive index, and n_y is the refractive index in a direction of a Y axis expressing a direction of the retardation film perpendicular both to the Z axis and to the X axis.

The transparent film provided on one of opposite surfaces of the retardation film has a thickness not larger than 10 μm and exhibits refractive index anisotropy of $n_x \approx n_y > n_z$ in which n_z is the refractive index in a direction of a Z axis expressing a direction of the thickness of the transparent film, n_x is the refractive index in a direction of an X axis expressing a direction of the transparent film in a plane perpendicular to the Z axis, and n_y is the refractive index in a direction of a Y axis expressing a direction of the transparent film perpendicular both to the Z axis and to the X axis.

III. Double Patenting Rejection

Claims 1-8 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-7 of copending Application No. 09/950,790 (assigned to the same assignee as the present application, Nitto Denko Corporation). Along with Request, Applicant is submitting a terminal disclaimer with regards to Application No. 09/950,790. Accordingly, the Examiner is requested to remove the double patenting rejection.

IV. Prior Art Rejections

A. Disclosure of Kameyama et al.

Kameyama et al. (U.S. Patent No. 5,999,243; hereafter "Kameyama") is directed to a liquid crystal element comprising oriented liquid crystal polymer with an average in-plane haze of 10% or higher. As shown in Figure 3, an optical element includes a liquid crystal element 1 and a $\frac{1}{4}$

wavelength plate (retardation film) 3 laminated thereon. The $\frac{1}{4}$ wavelength plate preferably has a frontal retardation $((n_x - n_y)d)$ of 100 to 180 nm, wherein n_x is the maximum in-plane refractive index, n_y is the refractive index in a direction perpendicular thereto, n_z is the refractive index in the thickness direction, and d is the thickness.

The $\frac{1}{4}$ wavelength plate may consist of only one retardation layer, or may comprise a multilayer structure comprising two or more retardation layers which differ in retardation. Further, a retardation layer may be used together with the above-described retardation layer functioning as a $\frac{1}{4}$ wavelength plate, wherein the optional retardation layer is intended to be used for compensation and preferably has a frontal retardation of 100 to 720 nm.

The retardation layer preferably used from the standpoints of color change compensation, etc. is one in which the thickness-direction refractive index is higher than at least one of the in-plane refractive indexes, or one in which N_z represented by $(n_x - n_z)/(n_x - n_y)$ is 5 or smaller, preferably 2 or smaller, more preferably 1.1 or smaller (these values of N_z may be minus numbers). The thickness of the retardation layer, based on a single-layer constitution, is generally from 5 to 500 μm , preferably from 10 to 300 μm , and more preferably from 20 to 200 μm .

B. Disclosure of Mori et al.

Mori et al. (U.S. Patent No. 5,805,253) discloses a liquid crystal display having a bend orientation cell or HAN mode cell and provided with an optical compensatory sheet which shows

the minimum of absolute values of retardation values in a direction inclined from the normal of the sheet.

As shown in Figure 9, the liquid crystal display comprises a liquid crystal cell PIC including a pair of substrates provided with a transparent electrode having an orientation layer thereon and a nematic liquid crystal sealed therebetween, a pair of polarizing plates A and B arranged on the both sides of the cell, the optical compensatory sheets OC1 and OC2 between the liquid crystal cell and the polarizing sheet and back light BL are assembled to constitute the liquid crystal display. The two optical compensatory sheets satisfy the condition: $0.2 \times Re2 \leq Re1 \leq 2.0 \times Re2$, wherein $Re1$ represents an absolute value of a sum of retardation values of the two optical compensatory sheets, and $Re2$ represents an absolute value of a retardation value of the layer of nematic liquid crystal of the liquid crystal cell.

C. Analysis

Claims 1-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kameyama. Claims 6-8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori in view of Kameyama. The Examiner contends that Kameyama discloses all of the features of independent claim 1 via the disclosed laminate of retardation layers forming the $\frac{1}{4}$ wavelength plate. That is, the Examiner appears to be taking the position that a first laminated retardation layer corresponds to the claimed transparent layer and a second laminated retardation layer corresponds to the claimed retardation film.

Applicant respectfully submits the claimed invention would not have been rendered obvious in view of Kameyama, alone or in combination with Mori. Applicant respectfully submits Kameyama does not teach or suggest the claimed transparent layer exhibiting refractive index anisotropy of $n_x \doteq n_y > n_z$, as claimed. The Examiner asserts that “[s]ince Kameyama et al. teaches that it is preferred that at least one retardation layer exhibits n_z greater than n_x , n_y (at least one of the in-plane refractive indexes), wherein $n_z > n_y$ for N_z less than 1, and since N_z can be greater than 1 (column 10, lines 1-70), it then follows that the other film can have a $n_z < N_y$ which satisfies the equation $n_x \leq n_y > n_z$.”¹ Although Applicant agrees that Kameyama appears to disclose n_z may be less than ($<$) n_y by disclosing that N_z is may be a positive number greater than 1 (e.g., 5 or smaller), nowhere does Kameyama teach or suggest that n_x is approximately equal to (i.e., “ \doteq ”) n_y .

Accordingly, Applicant respectfully submits that independent claim 1, as well as dependent claim 2-8, should be allowable over Kameyama since the reference does not teach or suggest all of the features of the claims.

V. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

¹ Applicant is unable to determine what relationship is express with the notation “ $n_x \leq n_y$ ”.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Patent Application No. 09/955,928

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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